International Studies in the Philosophy of Science

ISSN: 0269-8595 (Print) 1469-9281 (Online) Journal homepage: http://www.tandfonline.com/loi/cisp20

Cutting the Gordian Knot of Demarcation

Sven Ove Hansson

To cite this article: Sven Ove Hansson (2009) Cutting the Gordian Knot of Demarcation, International Studies in the Philosophy of Science, 23:3, 237-243, DOI: 10.1080/02698590903196007

To link to this article: http://dx.doi.org/10.1080/02698590903196007

Published online: 29 Sep 2009.

Submit your article to this journal

Article views: 306

View related articles

Citing articles: 6 View citing articles

Full Terms & Conditions of access and use can be found at
http://www.tandfonline.com/action/journalInformation?journalCode=cisp20

Download by: [University of Florida] **Date:** 31 October 2017, At: 12:25

International Studies in the Philosophy of Science
Vol. 23, No. 3, October 2009, pp. 237–243

Routledge
Taylor & Francis Group

Cutting the Gordian Knot of Demarcation

Sven Ove Hansson

Downloaded by [University of Florida] at 12:25 31 October 2017

A definition of pseudoscience is proposed, according to which a statement is pseudoscientific if and only if it (1) pertains to an issue within the domains of science, (2) is not epistemically warranted, and (3) is part of a doctrine whose major proponents try to create the impression that it is epistemically warranted. This approach has the advantage of separating the definition of pseudoscience from the justification of the claim that science represents the most epistemically warranted statements. The definition is used to explain why proponents of widely divergent criteria for the demarcation between science and pseudoscience tend to be in almost complete agreement on the particular demarcations that should presumably be based on these general criteria.

1. The Puzzle

In his debate with Karl R. Popper on the demarcation of science, Thomas S. Kuhn observed that although his own and Popper's criteria of demarcation were profoundly at variance, they led to essentially the same conclusions on what should in practice be counted as science and pseudoscience respectively (Kuhn 1974, 803). This is a remarkable concurrence, since the two criteria represent fundamentally different perspectives on science.

In the thirty-five years since Kuhn made this observation, several additional demarcation criteria have been proposed. Following Imre Lakatos (1970, 1974a, 1974b, 1981), Paul Thagard (1978) and Daniel Rothbart (1990) have characterized science in terms of the requirement that a new theory must always have a larger empirical content than its predecessor. George Reisch (1998) maintained that a scientific discipline is characterized by being adequately integrated into the other sciences. Many authors have put forward more complex demarcation criteria in the form of lists of (usually

Sven Ove Hansson is at the Department of Philosophy and the History of Technology, Royal Institute of Technology, Stockholm. Correspondence to: Department of Philosophy and the History of Technology, Royal Institute of Technology, Teknikringen 78, 100 44 Stockholm, Sweden. E-mail: soh@kth.se

ISSN 0269–8595 (print)/ISSN 1469–9281 (online) © 2009 Open Society Foundation
DOI: 10.1080/02698590903196007

between five and ten) characteristics to be used in combination to distinguish between scientific and pseudoscientific practices (Bunge 1982; Dutch 1982; Kitcher 1982, 30–54; Radner and Radner 1982; Hansson 1983; Grove 1985; Thagard 1988; Glymour and Stalker 1990; Derksen 1993 and 2001; Vollmer 1993; Ruse 1996, 300–306; Mahner 2007). In support of such approaches, Mario Bunge (1982, 372) asserted that no single criterion can provide us with an adequate demarcation. In a somewhat similar vein, John Dupré (1993, 242) proposed that science is best understood as a Wittgensteinian family resemblance concept.

Kuhn's observation is applicable not only to himself and Popper but also to the proposers of the various uni- and multi-dimensional definitions of pseudoscience that have since then been put forward. Many of these criteria are fundamentally different since they refer to different aspects of scientific inquiry. Nevertheless there is virtual unanimity among their proponents in concrete demarcation issues. There is widespread agreement for instance that creationism, astrology, homeopathy, Kirlian photography, dowsing, ufology, ancient astronaut theory, Holocaust denialism, and Velikovskian catastrophism are pseudosciences. In spite of a few points of controversy, for instance concerning the status of Freudian psychoanalysis (Grünbaum 1979; Cioffi 1998), the general picture is one of consensus rather than controversy in particular issues of demarcation.

How can there be so much agreement in particular issues of demarcation in spite of almost complete disagreement on the general criteria that these judgments should presumably be based upon? It is the purpose of the present contribution to solve this puzzle. In Sections 2 and 3, some preconditions are provided concerning the subject matter and the qualitative characteristics of scientific knowledge respectively. In Section 4, a new demarcation criterion for pseudoscience is proposed, and in Section 5 it is used to explain the puzzle just referred to.

2. The Subject Matter of Science and Pseudoscience

The term 'science' has two meaning components: a descriptive component that delimits the subject matter of scientific knowledge and a normative component that specifies its quality. It is due to the former component that excellent scholarly studies of ancient art are not regarded as science, and due to the latter that creationist interpretations of the fossil record are excluded.

The subject-area component has much less philosophical significance than the quality component. It also differs between languages. The English word 'science' is primarily used about the natural sciences and other fields of research that are considered to be similar to them. The corresponding German word, 'Wissenschaft', has a much broader meaning and covers all the academic disciplines, including the humanities. The German term has the advantage of more adequately delimiting the type of systematic knowledge that is at stake in the conflict between science and pseudoscience. The misrepresentations of history presented by Holocaust deniers and other pseudo-historians are very similar in nature to the misrepresentations of natural science promoted by creationists and homeopaths. Therefore, the conflict between

Downloaded by [University of Florida] at 12:25 31 October 2017

science and pseudoscience is best understood in terms of the division implied by the German term. On one side of the conflict we find the community of knowledge disciplines that includes the natural and social sciences and the humanities (Hansson 2007). On the other side we find a wide variety of movements and doctrines, such as creationism, astrology, homeopathy, and Holocaust denialism that are all in conflict with results and methods that are generally accepted in the community of knowledge disciplines.

In order not to become unmanageably complex, a definition of science has to go in one of two directions. It can focus on the descriptive meaning component, and specify how the term is actually used. Alternatively, it can focus on the normative component, and clarify the more fundamental meaning of the term. The latter approach has been the (mostly implicit) choice of most philosophers writing on the demarcation of science from pseudoscience. It will be followed here as well. It involves, of necessity, some degree of idealization in relation to common usage of the term 'science'. In what follows, the phrase 'science in a wide sense' will be used to denote what is called 'Wissenschaft' in German.

Downloaded by [University of Florida] at 12:25 31 October 2017

3. The Scientific Approach to Knowledge

It is the task of science to provide the most reliable information that we can obtain in its various subject areas. The pseudosciences fail to do this; in other words they promote factual statements that are not epistemically warranted (Fuller 1985, 331). The demarcation of science from pseudoscience is therefore part of the larger task to determine which beliefs are epistemically warranted.

The epistemic warrant referred to here is relative to the totality of evidence and knowledge that is available to human knowledge seekers at the time in question. It is not restricted to the evidence available to the individual who makes the statements. This collective approach is a major distinguishing characteristic of the subject matter of philosophy of science as compared to that of mainstream epistemology.

It follows that epistemic warrant varies across time. However, some authors have maintained that the demarcation between science and pseudoscience must be timeless. If this were true, then it would be contradictory to label a standpoint as pseudoscience at one but not at another point in time. Hence, after showing that creationism is in certain respects similar to some doctrines from the early 18th century, one author maintained that 'if such an activity was describable as science then, there is a cause for describing it as science now' (Dolby 1987, 207). This argument is based on a fundamental misconception of science. It is an essential feature of science that it strives for improvement through empirical testing, intellectual criticism, and the exploration of new terrain. A standpoint or theory cannot be scientific unless it relates adequately to this process of improvement. As a very minimum, this requires that well-founded rejections of previous scientific standpoints are accepted. The demarcation of science cannot be timeless, for the simple reason that science itself is not timeless.

4. How Pseudoscience Deviates

Many writers on the demarcation issue have emphasized that pseudoscience is non-science posing as science (Gardner 1957; Baigrie 1988, 438). A further, rather obvious requirement is that pseudoscience is concerned with the subject matter of science in the wide sense referred to above. Based on this, we can define a statement as pseudoscientific if and only if it satisfies the following three criteria:

(1) It pertains to an issue within the domains of science (in the wide sense).
(2) It is not epistemically warranted.
(3) Its major proponents try to create the impression that it is scientific.

An immediate problem with this definition is that (3) is too wide. There are phenomena that satisfy all three criteria but yet are not commonly called pseudoscientific, for reasons related to the third criterion. One of the clearest examples of this is fraud in science. Statements based on scientific fraud operate within the domains of science, lack epistemic justification, and are put forward with a high degree of scientific pretence. Hence, they satisfy all three criteria. Nevertheless, fraud in otherwise legitimate branches of science is seldom if ever called 'pseudoscience'.

As I have argued elsewhere (Hansson 1996), we tend to use the term 'pseudoscience' primarily in cases when a deviant doctrine is promoted. Pseudoscience, as it is commonly conceived, involves a sustained effort to promote teachings different from those that have scientific legitimacy at the time. In order to accommodate this feature, (3) can be replaced by the following:

(3′) It is part of a doctrine whose major proponents try to create the impression that it is scientific.

By replacing (3) by (3′) we solve the problem for the first definition that is created by examples such as scientific fraud. It seems to be an essential property of pseudosciences that they involve deviant teachings or doctrines that have some degree of consistency and unifying purpose. However, some of the deviant doctrines put forward by pseudoscientists do not satisfy (3′). Some proponents of astrology or homeopathy do not claim that their theories are scientific, but instead claim that what they put forward is reliable knowledge, based on better sources than those available to science. Such theories are commonly called pseudoscientific. A definition of pseudoscience should cover this type of claim as well. To that purpose, (3′) can be modified as follows:

(3″) It is part of a doctrine whose major proponents try to create the impression that it is epistemically warranted.

The combination (1) & (2) & (3″) is proposed as a definition of pseudoscience that is in better accord with common usage than previous definitions. It operates on a different level than most of its predecessors. Instead of specifying the features of science that make it epistemically privileged, it cuts through that issue and simply assumes that science provides us with the most epistemically warranted statements that can be made, at the time being, on the subject matter within its domain. Pseudoscience is defined as deviating from science in specified ways. This definitional structure separates the

Downloaded by [University of Florida] at 12:25 31 October 2017

definition of pseudoscience from the issue of justifying the claims of science to represent the most epistemically warranted statements. This is as it should be. The epistemic foundations of science are best investigated as an issue in its own right, rather than as an offshoot from discussions on pseudoscience.

5. Back to the Puzzle

The proposed definition of pseudoscience, (1) & (2) & (3″), turns out to be helpful in solving the puzzle that was presented in Section 1. Although all three components in this definition are essential for the delimitation, the focus in all the various demarcation proposals is on (2); in other words these proposed demarcations all attempt to specify why the claims made by pseudoscientists are not epistemically warranted.

The various demarcation criteria are therefore best understood as attempts to capture the underlying, more basic criterion 'not epistemically warranted'. The proposed criteria are all to some extent vague and they are less than perfectly satisfied even by *bona fide* science. Hence Kuhn's (1974) own criterion is that science but not pseudoscience is capable of puzzle-solving. Capability of puzzle-solving is not an all-or-nothing issue but comes in degrees. It differs among the scientific disciplines, and even pseudosciences have it to some degree. Therefore, this criterion has to be supplemented with judgments of *how much* puzzle-solving ability can minimally be required of a science. These judgments will in practice be informed by the underlying criterion of epistemic warrant. Since astrology is epistemically unwarranted, we tend to consider its (low) level of puzzle-solving ability to be insufficient for status as a science. In contrast, since the standard account of human macroscopic anatomy is epistemically warranted, we tend to regard its (also quite low) level of puzzle-solving ability as sufficient for status as a science.

Similarly, a reasonable interpretation of Popper's criterion of falsifiability will have to take falsifiability as a matter of degree rather than an all-or-nothing criterion. Admittedly, in Popper's (1989) last published version of the criterion, falsifiability is described as determined by the logical structure of sentences and hence an all-or-nothing matter. But this is a highly implausible version that would for instance imply that a statement's status as scientific or non-scientific does not shift with time. Less absolute versions of falsifiability find support in other writings by Popper (1974; Cioffi 1985; Feleppa 1990). According to these more plausible interpretations, falsifiability comes out as a property that scientific theories have to different degrees and many pseudoscientific theories to (lower) degrees. Thus the same argument is applicable here as to Kuhn's criterion. It is also applicable to the various other demarcation criteria that were referred to in Section 1.

In addition to resolving this puzzle, the underlying criterion of epistemic warrant provides us with a critical tool that we can apply to proposed criteria of demarcation. Instead of asking 'Can this criterion demarcate science adequately from pseudoscience?', we should ask: 'Does this criterion help us to demarcate science from pseudoscience any better than the underlying criterion of epistemic warrant?' It is far from

Downloaded by [University of Florida] at 12:25 31 October 2017

obvious that this question can be answered in the affirmative for the more common demarcation criteria such as those referred to above.

References

Baigrie, Brian S. 1988. Siegel on the rationality of science. *Philosophy of Science* 55: 435–441.

Bunge, Mario. 1982. Demarcating science from pseudoscience. *Fundamenta Scientiae* 3: 369–388.

Cioffi, Frank. 1985. Psychoanalysis, pseudoscience and testability. In *Popper and the human sciences,* edited by Gregory Currie and Alan Musgrave, 13–44. Dordrecht: Martinus Nijhoff.

———. 1998. *Freud and the question of pseudoscience.* Chicago, IL: Open Court.

Derksen, A. A. 1993. The seven sins of pseudoscience. *Journal for General Philosophy of Science* 24: 17–42.

———. 2001. The seven strategies of the sophisticated pseudoscience: A look into Freud's rhetorical tool box. *Journal for General Philosophy of Science* 32: 329–350.

Dolby, R. G. A. 1987. Science and pseudoscience: The case of creationism. *Zygon* 22: 195–212.

Dupré, John. 1993. *The disorder of things: Metaphysical foundations of the disunity of science.* Cambridge, MA: Harvard University Press.

Dutch, Steven I. 1982. Notes on the nature of fringe science. *Journal of Geological Education* 30: 6–13.

Feleppa, Robert. 1990. Kuhn, Popper, and the normative problem of demarcation. In *Philosophy of science and the occult,* edited by Patrick Grim, 140–155. 2nd ed. Albany: SUNY Press.

Fuller, Steve. 1985. The demarcation of science: A problem whose demise has been greatly exaggerated. *Pacific Philosophical Quarterly* 66: 329–341.

Gardner, Martin. 1957. *Fads and fallacies in the name of science.* New York: Dover.

Glymour, Clark, and Douglas Stalker. 1990. Winning through pseudoscience. In *Philosophy of science and the occult,* edited by Patrick Grim, 92–103. 2nd ed. Albany: SUNY Press.

Grove, J. W. 1985. Rationality at risk: Science against pseudoscience. *Minerva* 23: 216–240.

Grünbaum, Adolf. 1979. Is Freudian psychoanalytic theory pseudoscientific by Karl Popper's criterion of demarcation? *American Philosophical Quarterly* 16: 131–141.

Hansson, Sven Ove. 1983. *Vetenskap och ovetenskap.* Stockholm: Tiden.

———. 1996. Defining pseudoscience. *Philosophia Naturalis* 33: 169–176.

———. 2007. Values in pure and applied science. *Foundations of Science* 12: 257–268.

Kitcher, Philip. 1982. *Abusing science: The case against creationism*. Cambridge, MA: MIT Press.

Kuhn, Thomas S. 1974. Logic of discovery or psychology of research? In *The philosophy of Karl Popper,* edited by P. A. Schilpp, 798–819. La Salle, IL: Open Court.

Lakatos, Imre. 1970. Falsification and the methodology of scientific research programmes. In *Criticism and the growth of knowledge,* edited by Imre Lakatos and Alan Musgrave, 91–197. Cambridge: Cambridge University Press.

———. 1974a. Popper on demarcation and induction. In *The philosophy of Karl Popper,* edited by P. A. Schilpp, 241–273. La Salle, IL: Open Court.

———. 1974b. Science and pseudoscience. *Conceptus* 8: 5–9.

———. 1981. Science and pseudoscience. In *Conceptions of inquiry: A reader,* edited by Stuart Brown, John Fauvel, and Ruth Finnegan, 114–121. London: Methuen.

Mahner, Martin. 2007. Demarcating science from non-science. In *Handbook of the philosophy of science: General philosophy of science—Focal issues,* edited by Theo Kuipers, 515–575. Amsterdam: Elsevier.

Popper, Karl R. 1974. Reply to my critics. In *The philosophy of Karl Popper,* edited by P. A. Schilpp, 961–1197. La Salle, IL: Open Court.

———. 1989. Falsifizierbarkeit, zwei Bedeutungen von. In *Handlexikon zur Wissenschaftstheorie,* edited by Helmut Seiffert and Gerard Radnitzky, 82–86. 2nd ed., 1994. München: Ehrenwirth.

Radner, Daisie, and Michael Radner. 1982. *Science and unreason.* Belmont, CA: Wadsworth.

Downloaded by [University of Florida] at 12:25 31 October 2017

Reisch, George A. 1998. Pluralism, logical empiricism, and the problem of pseudoscience. *Philosophy of Science* 65: 333–348.

Rothbart, Daniel. 1990. Demarcating genuine science from pseudoscience. In *Philosophy of science and the occult,* edited by Patrick Grim, 111–122. 2nd ed. Albany: SUNY Press.

Ruse, Michael, ed. 1996. *But is it science? The philosophical question in the creation/evolution controversy.* Amherst, NY: Prometheus Books.

Thagard, Paul R. 1978. Why astrology is a pseudoscience. In *PSA 1978: Proceedings of the 1978 Biennial Meeting of the Philosophy of Science Association,* edited by Peter D. Asquith and Ian Hacking, 1: 223–234. East Lansing, MI: Philosophy of Science Association.

———. 1988. *Computational philosophy of science.* Cambridge, MA: MIT Press.

Vollmer, Gerhard. 1993. *Wissenschaftstheorie im Einsatz: Beiträge zu einer selbstkritischen Wissenschaftsphilosophie.* Stuttgart: Hirzel.

Downloaded by [University of Florida] at 12:25 31 October 2017